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Choosing Factors for the Vietnamese Stock Market †

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Abstract: In this paper, we test the applicability of different Fama–French (FF) factor models in Vietnam, we investigate the value factor redundancy and examine the choice of the profitability factor. Our empirical evidence shows that the FF five-factor model has more explanatory power than the FF three-factor model. The value factor remains important after the inclusion of profitability and investment factors. Operating profitability performs better than cash and return-on-equity (ROE) profitability as a proxy for the profitability factor in FF factor modeling. The value factor and operating profitability have the biggest marginal contribution to a maximum squared Sharpe ratio for the five-factor model factors, highlighting the value factor (HML) non-redundancy in describing stock returns in Vietnam.

Keywords: Fama–French factor model; asset pricing tests; state ownership; SOE; emerging market; Vietnam

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1. Introduction

Since they were introduced over the past 50 years, Fama–MacBeth cross-sectional regressions (Fama and Macbeth 1973) have become a standard tool in asset pricing testing that links the average stock returns to its characteristics. Thirty years later, Fama and French (1993) introduced time-series three-factor models to explain the variation in stock returns. Until recently, it has become clear that there is a wide array of asset pricing anomalies that these models cannot explain. The new five-factor model (Fama and French 2015) tries to explain the relationship between these new factors (profitability and investment) and stock expected returns. There are now debates over which factors to use in asset pricing models (Fama and French 2018; Hou et al. 2019, Ball et al. 2015), especially with regard to the controversy around the choice of a proxy for the profitability factor and the issue of value factor redundancy (Fama and French 2015). What is more, the findings of Fama and French (2017) suggest that Japanese stock returns have little relation to new factors. Cakici (2015) reports similar results and concludes that with the inclusion of the two new factors, the value factor becomes redundant in North American, European and global portfolios, but not in the Asia Pacific region. All of the aforementioned literature lends this work grounds to believe that the performance of the factor models and the choice of a superior factor model are specific to a country or a region.

Motivated by the recent Fama and French's (2018) analysis of a metric for ranking asset pricing models, our paper examines the Fama–French (FF hereafter) multi-factor models (Fama and French 1993, 2015) in asset pricing for the equity market of Vietnam. This new approach is designed to overcome the challenge in choosing the best model among competing models with different factors in light of different anomalies previously discovered in international markets. This study adds to the current literature further empirical evidence from a developing country that the FF five-factor model (Fama and French 2015) outperforms the traditional FF three-factor model (Fama and French 1993), which is consistent with Fama and French's (2017) findings in the stock markets of 25 developed countries. However, our findings are contrary to Fama and French's (2015, 2018) conclusion about the redundancy of the value factor (i.e., the book-to-market ratio) in the new five-factor model and the superiority of the cash profitability factor as the variable used to construct profitability factors.

This study aimed to add to the international empirical literature on asset pricing tests with a detailed investigation of the Vietnamese stock market, the youngest in the Association of Southeast Asian Nations (ASEAN) region, where the economy has gone through a massive privatization process over the past decade. Our paper entails a study of all major asset pricing models, both traditional and new, for the fast-growing market of Vietnam that features different financial market development conditions as well as a different political system. It is crucial to test this market as an example of the emerging stock market in order to conclude whether the Fama and French (2015) five-factor model's superior performance is consistent regardless of the capital market development stage, economic conditions and political system.

Our research deals with the following questions: (1) which multi-factor model (FF three-factor, FF four-factor or FF five-factor) best describes the behavior of the stock market of Vietnam? (2) Does the value factor become redundant for explaining the stock returns in a developing economy after including new factors into the asset pricing model? (3) Is the new five-factor model (Fama and French 2015) sensitive to the choice of the profitability factor in the context of the Vietnamese market? (4) How do the asset pricing models perform under different ownership structures?

Our study makes four contributions to the current asset-pricing literature. First, this study reveals new evidence on the forecasting power of the FF factor models in the context of an emerging stock market featuring a state dominant role in society. We present further evidence supporting Fama and French's (2017) claim about the superiority of the five-factor model for a liberalized market where a country is dominated by individual investors. Second, the paper provides further evidence on the controversy regarding the redundancy of the value factor in the presence of profitability and investment factors in the model (Fama and French 2015, 2017, 2018; Cakici 2015; Chiah et al. 2016). Our results urge the need for the developing market verification of the results evident in developed countries. Third, this paper provides new evidence on the controversy regarding the choice of a profitability proxy to construct the profitability factor in the five-factor model (Fama and French 2017, 2018; Ball et al. 2015; Hou et al. 2019; Novy-Marx 2013). Lastly, this study reveals further findings on the performance of the asset pricing models using different profitability measures for state ownership of Vietnamese listed firms.

The remainder of this paper is organized as follows. Section 2 discusses asset pricing literature. Section 3 describes the data and methodology used in our analysis, including factor design and the construction of test portfolios, with a detailed analysis of the state ownership–stock return relationship in Vietnam. Section 4 delivers empirical results on the FF five-factor model (Fama and French 2015) as compared to the three-factor framework (Fama and French 1993), with a focus on the state ownership structure of listed firms. Section 5 verifies whether the value factor is redundant for explaining expected stock returns in Vietnam. Section 5 investigates different measures for a profitability factor in the five-factor model. Section 7 offers further results of the value factor non-redundancy and the choice of a profitability factor. Section 8 concludes our findings. In Appendix A, we provide an overview of the Vietnamese stock market, with a description of its distinctive features.

2. Literature Review

In the past 20 years of the Fama–French three-factor model, it has become clear that there is a wide array of asset pricing anomalies that these models cannot explain. Among the anomalies—such as momentum (Jegadeesh and Titman 1993), return reversal (Huang et al. 2010), liquidity risk (Pástor and Stambaugh 2003) and idiosyncratic volatility (Ang et al. 2006)—there are profitability and investment patterns that burden different models from explaining the cross-sectional variation in expected returns (Hou et al. 2015; Novy-Marx 2013; Titman et al. 2004). Hou et al. (2015, 2019) provide evidence that the *q*-factor model (with profitability and investment factors) outperforms the FF three-factor (Fama and French 1993) and Carhart (1997) four-factor models in explaining the returns of a broad list of anomalies. Cueto et al. (2020) suggest that the use of the market, skewness and coefficient of variation as model factors better improve the capital asset pricing models.

The new five-factor model (Fama and French 2015) tries to explain the relationship between these new variables and stock expected returns from the dividend discount model perspective and the valuation theory. Fama and French (2015) suggest using profitability and investment factors, in addition to existing factors (market, size and value), to capture patterns in average stock returns. Fama and French's (2015) findings also suggest that the value factor (i.e., the book-to-market ratio) is redundant for explaining returns in the five-factor model that performs better in terms of describing the expected stock returns.

However, when testing on international markets, Fama and French (2017) find evidence that the five-factor model performs better in North America and Europe and for big stocks. Their findings also suggest that Japanese stock returns have little relation to new factors. Cakici (2015) reports similar results. Cakici compares the three-factor, four-factor and five-factor models on 23 developed stock markets and finds strong evidence for the five-factor model in North America, Europe and the global market. The author concludes that with the inclusion of the two new factors, the value factor becomes redundant in North American, European and global portfolios, but not in the Asia Pacific region. Hence, it is more appropriate to assess the performance of the FF five-factor model at the country or regional level. Fama and French (2018) argue that the performance of the five-factor model is sensitive to the choice of the profitability factor, which improves the description of average portfolio returns. They provide evidence that cash profitability (Ball et al. 2015) would be more appropriate than the operating profitability in the five-factor model. On the other hand, Hou et al. (2019) suggest that the *q*-factor model outperforms the FF five-factor model (2015). Fama and French (2018) using the maximum squared Sharpe ratio of intercepts and a model's factors (Barillas and Shanken 2017) document the superiority of the cash profitability over operating profitability in the five-factor modeling. Furthermore, their results provide evidence that the value factor adds no marginal contribution to the maximum squared Sharpe ratio of the five-factor model.

In the latest work of Fama and French (2020), the authors used Fama–MacBeth cross-sectional factors (Fama and Macbeth 1973) in the time-series model setting to investigate competing models in light of different methodologies developed in asset pricing literature. Fama and French (2020) conclude that the time-series factor models with cross-sectional factor returns are superior to that of time-series factor returns.

Little, if any, has been published on the choice of the value and profitability factors for an emerging market and the explanatory power of the FF five-factor model. Heaney et al. (2016) findings show that the correlation between asset returns and market-to-book firm characteristic is sensitive to an asset pricing model used in risk adjustment and this firm property is absorbed by the FF five-factor model, suggesting the latter model might be a better choice for asset pricing tests for the Australian equity market. However, there is no research exploring the question of the choice of factors in FF multi-factor models over the traditional models for an emerging market; hence, this paper addresses this gap in the literature.

Despite the considerable literature on capital asset pricing models (CAPM) for emerging markets, we know of limited study that has applied the three-factor model to emerging markets. Notably, there is a study on ASEAN markets that uses the Fama–French three-factor model in the analysis of five markets, namely Malaysia, Singapore, Thailand, Indonesia, and the Philippines (Nartea et al. 2011). By providing evidence of a positive relationship between idiosyncratic volatility and stock returns in Malaysia, Singapore, Thailand and Indonesia, the authors claim that generalizing empirical results obtained in developed stock markets to new and emerging markets could be potentially misleading. Nartea et al. (2013) also suggested verifying the findings evident in developed countries for emerging markets at a country level due to distinctive features of each country when analyzing idiosyncratic volatility for the Chinese stock market. There are other papers that deal with the asset pricing issue in Asian markets. Momentum and information uncertainty have been identified as a pricing factors (Cheema and Nartea 2014). Volatility or the MAX effect are also under the three-factor model's analysis for Hong Kong (Nartea and Wu 2013) and South Korean markets (Nartea et al. 2014), respectively. There is no evidence of the superiority of the newly established five-factor model (Fama and French 2015) or any investigation on a factor modeling in a setting for a country in Asia. Our paper provides new evidence on the value factor non-redundancy, operating profitability (Novy-Marx 2013) supremacy and Fama–French five-factor model superiority for the region.

Literature studying Vietnam's stock market is sparse. Chang and Vo (2020) pointed out the challenge in conducting quantitative studies for Vietnam due to limited data. Fang et al. (2017) studied the three-factor model for the stock market in Vietnam using idiosyncratic risk-sorted portfolios. Notably, they only test the three-factor model on portfolios formed on size and book-to-market. While their study finds support for the three-factor model, the methodology of creating three factors does not follow Fama and French's (1993) methodology. In addition, their model's test results suggest that size and value factors fail to explain the returns of value-weighted portfolios sorted on idiosyncratic risk. As with most findings in the finance literature, some studies also document other capital anomalies, such as liquidity, in Vietnam. Batten and Vo (2014) show a positive relationship between liquidity and Vietnamese stock returns during the global financial crisis.

There also has not been much research in the context of state ownership and stock returns, which we consider as an important factor for a transitional economy, like Vietnam, that is not fully integrated with the global financial market. Empirical studies provide mixed or contradictory evidence from developed countries, developing markets or transitional economies (Fama and Jensen (1983) showed that an increase in managerial ownership would lead to an increased entrenchment of managers. McConnell and Servaes (1990) and Cornett et al. (2010) analyzed the linkage between ownership structure and the performance of firms (measured by ROA, ROE). Lin and Zhang (2009) provided evidence that the "Big Four" state-owned commercial banks in China are less profitable and less efficient and have a lower quality of assets than other types of banks).

3. Data and Methodology

3.1. Data

The analysis in this study was conducted for all common stocks traded on the Hochiminh and Hanoi Stock Exchanges (inclusive of the Unlisted Public Company Market – UPCoM) at a monthly frequency from August 2007 to July 2015 (For UPCoM, stocks prices were obtained at the end of 2014). The source of data was the Thomson Reuters (Datastream) database, which includes daily data of adjusted closing prices, trading volume, market-to-book ratios, market capitalization, total assets as well as annual information of revenue, administrative expense, interest expense, cost of goods sold and state ownership. An interbank offer rate was also extracted monthly from Datastream and used as the risk-free rate in this study to be consistent with previous studies on Vietnam.

To be in the sample for the analysis, all stocks must have daily returns of no greater than 50% in absolute terms and monthly returns of no more than 200% to prevent stocks with abnormal trading or price errors on Datastream system. To reduce the impact of infrequent trading, all stocks with no return data for the previous 10 consecutive business days were excluded from the analysis in that specific month. In addition, stocks with no return data for more than 10 business days in a month were omitted from the sample during that month (Angelides (2010) removed all the stocks that have fewer than five observations during a month). We also excluded all stocks with negative book-to-market ratios from the sample to be consistent with Fama and French's (1993, 2015) methodology. To be in the sample on a specific date, in addition to having required accounting data (To reduce the noise in computing variables, we excluded several stocks with extreme values of book-to-market ratio (higher than 8.0), operating profitability ratio (more than 100%) and investment ratio (higher than 4.0)) as prescribed by Fama and French (1993, 2015), companies must have a valid trade and not have been delisted prior to the formation period.

Table 1 presents the coverage of stocks used in our sample. Hence, we have 135 stocks in December 2007 and 438 stocks in 2015, accounting for 1,113,948 daily and 50,112 monthly observations in total, respectively. Our sample covers about 60% of the population of ordinary stocks in the Datastream database and represents 89 and 73% of the market in terms of total trading value and market capitalization, respectively, over our sample period (It is important to note that we did not completely exclude stocks out of the entire sample. We only omitted them for the specific month that they have inadequate trading (no return data for the previous 10 consecutive business days or no return data for more than 10 business days in total during a month) and included them again whenever they satisfied our criteria on trading activities). On average, we have 56 state-owned enterprises (SOEs) in a year, equivalent to 16.32% of average annual stock in our sample.

Table 1. Sample coverage for the Vietnamese stock market. Co is the number of listed companies during a year. MCap is market capitalization in trillions of Vietnamese Dong (VND) as at the end of a year. Value and Volume are the annual trading value (in trillions of VND) and trading volume (in millions of shares) of all stocks. OP, CP and RP are the average value of operating profitability ratio, cash profitability ratio and ROE profitability ratio per stock, respectively, using Fama and French (2015, 2018, 2019), Ball et al. (2015) and Hou et al. (2019) profitability definitions. INV is the average investment ratio per stock, respectively, as defined using Fama and French (2015) methodology. BM is the average book-to-market ratio per stock. SOE is the number of listed companies that have state share of ownership. Data were obtained from Datastream from July 2007 to August 2015.

Year	Co	MCap	Value	Volume	OP	CP	RP	INV	BM	SOE
2007	135	334.5	267.6	2.610	0.0523	0.102	0.157	0.689	0.442	31
2008	189	148.3	120.5	5.261	0.0563	0.100	0.051	0.278	0.885	44
2009	279	371.0	445.9	18.79	0.0579	0.088	0.094	0.331	0.928	54
2010	400	453.1	408.0	19.12	0.0655	0.089	0.100	0.342	0.813	64
2011	421	308.9	137.6	11.27	0.0709	0.092	0.069	0.151	1.488	67
2012	442	383.4	193.2	18.77	0.0770	0.090	0.049	0.046	1.879	70
2013	425	446.9	229.7	22.09	0.0747	0.086	0.049	0.069	1.939	62
2014	460	542.2	523.1	40.16	0.0783	0.087	0.066	0.125	1.416	62
2015	438	623.1	255.8	18.83	n/a	n/a	n/a	n/a	1.319	47

By applying the Fama and French (1993, 2015) methodology, for inclusion in a portfolio in July of each year (annual rebalancing) a stock must have market equity data for December of the previous year and June of the current year; a non-missing (positive) book-to-market ratio for December of the previous year; non-missing revenues and at least one of the following: the cost of goods sold, sales, general and administrative expenses, or interest expense at the end of the fiscal year (December) ending in the previous year; and total assets data at the end of the fiscal year ending in year $t-1$ and $t-2$.

3.2. Fama–French Five Factor Construction

We followed the FF methodology in constructing risk factors (Fama and French 1993, 2015).

3.2.1. Market Factor (MKT)

Market factor (MKT) is the average excess return on a market portfolio constructed from our sample of stocks. MKT is value-weighted using market capitalization as at the end of month $t - 1$. The excess return of each stock is calculated as a monthly percentage change in a stock's price less the interbank offer rate in Vietnam.

3.2.2. Size Factor (SMB)

To form a size portfolio in July of year t, stocks are sorted by the market equity at the end of June of each year t. The stocks are allocated to two size portfolios (small and large), depending on whether their market equity is above or below the median. These two portfolios are annually rebalanced, with average returns calculated under a value-weighted approach. The size factor (SMB) is the return difference between the average returns on the small firms' portfolios and the average returns on big firms' portfolios.

3.2.3. Value Factor (HML)

The book-to-market sort uses the book-to-market ratio for the fiscal year ending in calendar year $t - 1$ (at the end of December of $t - 1$). Three portfolios are formed using breakpoints at from the 30th to 70th percentiles. These portfolios are annually rebalanced, with average returns calculated under a value-weighted approach. From the independent sorting, we construct six portfolios from the intersection of two size and three book-to-market portfolios. The value factor (HML) is the return difference between the high book-to-market portfolios and the low book-to-market portfolios.

3.2.4. Operating, Cash and ROE Profitability Factor (RMW, RWMC and RMWR)

Operating profitability (RMW) uses accounting data for the fiscal year ending in calendar year $t - 1$. For portfolios formed in June of year t, operating profitability is defined as annual revenues minus the cost of sold goods, interest expense, and selling, general and administrative expenses, all divided by book equity (Fama and French 2015; Novy-Marx 2013). Three portfolios are formed using the breakpoints of 30 and 70%. These portfolios are annually rebalanced, with average returns calculated using the value-weighted approach. We construct six portfolios from the intersection of two size and three profitability portfolios. The RMW factor is the return difference between the average returns on the high (robust) profitability portfolios and the average returns on the low (weak) profitability portfolios.

We also use cash profitability (RMWC) suggested by Fama and French (2018) and Ball et al. (2015) and the return-on-equity (ROE) profitability (RMWR) of Hou et al. (2019) in our factor testing to determine which profitability definition would be the best to use in the FF five-factor model to describe the stock returns. However, to make the analysis on different profitability factors more comparable, we use one-year-lagged book equity to calculate ROE profitability (We follow Fama and French's (2015, 2016, 2017) methodology of one-year-lagged book equity as opposed to Hou et al.'s (2018) approach that uses one-quarter-lagged book equity in the calculation of the profitability factor) and a conventional double (2 × 3) sorting by size and profitability.

3.2.5. Investment Factor (CMA)

For portfolios formed in June of year t, CMA uses the change in total book equity in the fiscal year $t-1$ compared with the fiscal year $t-2$. Three portfolios are formed using the breakpoints of 30 and 70%. These portfolios are annually rebalanced, with average returns calculated using the value-weighted approach. We construct six portfolios from the intersection of two size and three investment portfolios. The CMA factor is the return difference between the average returns on the conservative (low) investment portfolios and the average returns on the aggressive (high) investment portfolios.

Table 2 presents the summary statistics of all factors. Panel A shows that the factors have a negative market premium, consistent with Fang et al. (2017). The market premium (mean MKT) for Vietnam is −0.65% per month, the size premium (mean SMB) and the value premium (mean SMB) are 0.38 and 0.61%, respectively. The monthly premium for profitability and investment have the value of 0.34 and 0.095% during the 2008–2015 period.

Table 2. Summary statistics for Fama–French factors of Vietnamese stocks.

Panel A: Summary statistics						
Factor	**Mean**	**Std. dev.**	**Skewness**	**Kurtosis**	**Min.**	**Max.**
MKT	−0.0065	0.0843	−0.0244	3.7537	−0.2457	0.2390
SMB	0.0038	0.0540	0.0002	3.9358	−0.1388	0.1704
HML	0.0061	0.0464	0.9480	5.9929	−0.0978	0.1774
RMW	0.0034	0.0378	−0.1730	5.3969	−0.1249	0.1277
CMA	0.0010	0.0349	−0.4653	3.5054	−0.1004	0.0792
Panel B: Correlation						
Factor	**MKT**	**SMB**	**HML**	**RMW**	**CMA**	
MKT	1					
SMB	−0.0640	1				
HML	0.1287	0.3821	1			
RMW	−0.0844	−0.5832	−0.4928	1		
CMA	−0.2159	0.1076	0.4888	−0.2730	1	

Panel (**A**) reports the summary statistics for the Fama–French's monthly risk factors. Panel (**B**) reports the time-series correlation between the factors. In July of year t, we form two size portfolios based on market capitalization as at the end of year $t-1$ and use the median as the breakpoint. These two portfolios are calculated using monthly returns and rebalanced annually. The size factor (SMB) is the return difference between the average returns on the small firm portfolios and the average returns on the portfolios containing large firms. We then construct six portfolios from the intersection of two size and three book-to-market portfolios (SL, SN, SH, BL, BN, BH) based on the 30th and 70th percentiles. The value factor (HML) is the return difference between the average returns on the high book-to-market portfolios and the average returns on the low book-to-market portfolios. Similarly, we construct six portfolios from the intersection of two size and three profitability portfolios (SR, SN, SW, BR, BN and BW). Profitability factor (RMW) is the return difference between the average returns on the robust profitability portfolios and the average returns on the weak profitability portfolios. Six portfolios are from the intersection of the two size and three investment portfolios (SC, SN, SA, BC, BN and BA). The investment factor (CMA) factor is the return difference between the average returns on the conservative investment portfolios and the average returns on the aggressive investment portfolios. All portfolios are value-weighted, and the returns are in percentages. MKT is the value-weighted excess return on the market portfolio of all sample stocks minus the one-month interbank offer rate. Statistics reported are the mean, median, standard deviation (st.dev), maximum (max), minimum (min), skewness and kurtosis. The sample is from September 2008 to July 2015. The factors are calculated as follows (Fama and French 2015) with S and B denoting small- and big-sized portfolios, H, N and L for high, medium and low B/M, R, N and W for robust, medium and weak profitability, and C, N and A for conservative, medium and aggressive investment:

$$SMB = \frac{SH + SN + SL}{3} - \frac{BH + BN + BL}{3} + \frac{SR + SN + SW}{3} - \frac{BR + BN + BW}{3} + \frac{SC + SN + SA}{3} - \frac{BC + BN + BA}{3}$$

$$HML = \frac{(SH - SL) + (BH - BL)}{2}; RMW = \frac{(SR - SW) + (BR - BW)}{2}; CMA = \frac{(SC - SA) + (BC - BA)}{2}.$$

Panel B of Table 2 shows the correlations between the factors. Consistent with Fama and French (2015), profitability (RMW) is negatively correlated with all factors. There is a negative and high correlation between RMW with SMB and HML, suggesting smaller-sized companies tend to be high book-to-market (B/M) firms and they seem to be less profitable. There is a positive and high correlation between HML and CMA, indicating companies with a high book-to-market (B/M) values tend to be low-investment firms. While RMW and CMA are each negatively correlated with MKT as Fama and French (2015) report, there is no correlation between SMB and MKT, similar to that of Australia (Chiah et al. 2016).

3.3. Factor Model Tests

Following Fama and French (2018), we apply two approaches to deal with our task of the factor choice.

3.3.1. Left-Hand-Side (LHS) Approach for Nested Models

The first approach, LHS approach, is used to assess competing models with distinct factors (i.e., nested models) to capture excess returns of different sets of LHS stock portfolios.

Given it is impossible to make meaningful statistical inference of 316 factors (Harvey et al. 2016), Fama and French (2018) suggest using a limited number of factors in a model testing and a short list of model alternatives for comparison purposes. Hence, we investigate the performance of three multi-factor models of Fama and French (1993, 2015):

Three-factor model

$$R_{p,t} = \alpha_p + b_p MKT_t + s_p SMB_t + h_p HML_t + \varepsilon_{p,t} \quad (1)$$

Four-factor model (five-factor model without HML)

$$R_{p,t} = \alpha_p + b_p MKT_t + s_p SMB_t + h_p HML_t + \varepsilon_{p,t} \quad (2)$$

Five-factor model

$$R_{p,t} = \alpha_p + b_p MKT_t + s_p SMB_t + h_p HML_t + r_p RMW_t + c_p CMA_t + \varepsilon_{p,t} \quad (3)$$

where $R_{p,t}$ is the returns of portfolio p in month t; SMB_t, HML_t, RMW_t and CMA_t are the factor-mimicking portfolios for size, value, profitability and investment of Vietnamese equities; and MKT_t is the monthly excess returns on Vietnam's stock market portfolio.

We investigate the explanatory power of the new five-factor model on the variation of stock returns by looking at the average adjusted R^2, GRS (Gibbons et al. 1989) test statistics and its p-value (Gibbons et al. 1989), the average value of absolute intercepts, $A|\alpha|$, the Sharpe ratio for the intercept, $Sh(\alpha)$, the maximum squared Sharpe ratio for intercepts, $Sh^2(\alpha)$ (Fama and French 2018), and the maximum squared Sharpe ratio for a model's factors, $Sh^2(f)$, (Barillas and Shanken 2017). GRS tests whether the regression intercepts are jointly equal to zero. As Merton (1973) suggests, the intercept is indistinguishable from zero if an asset pricing model completely captures expected returns. According to Lewellen and Nagel (2006), the smaller $Sh(\alpha)$, the fewer unexplained average returns; hence, the better the model. In the same manner, we used average absolute intercepts, $A|\alpha|$, of the portfolios under analysis to assess the performance of the models. The model that best describes the variation in stock returns across portfolios is the one that provides the lowest value of $A|\alpha|$. Fama and French (2018) suggest to use the maximum squared Sharpe ratio of time-series regression's intercepts, $Sh^2(\alpha)$, and the maximum Sharpe ratio for a model's factors, $Sh^2(f)$ to overcome the limitation of other asset pricing tests when dealing with the issue of varying inferences across sets of LHS portfolios. $Sh^2(\alpha)$ and $Sh^2(f)$ assist us in judging the competing factor models and can be used as ultimate metrics for ranking asset pricing models. The best model is the one that provides the lowest $Sh^2(\alpha)$ and whose factors have the highest $Sh^2(f)$.

3.3.2. Right-Hand-Side (RHS) Approach for Non-Nested Models

The second approach, the RHS approach, is applied to spanning regressions to assess whether a specific factor should be added to a (non-nested) model by looking at its contribution to an explanation of the average portfolio excess returns provided by a model. The marginal contribution of a factor to a model, $\alpha^2/sd^2(e)$, is calculated as the ratio of the squared intercepts in a spanning regression of the factor on the model's remaining factors and the residual variance of the same spanning regression (Fama and French 2018). A factor that has high value of $\alpha^2/sd^2(e)$ compared with other factors in a model is considered to have a significant contribution to the model in capturing stock returns. This approach assists us in estimating the role of a factor in a specified model and deciding on the relevancy or redundancy of a factor.

Since there has been controversy in the value factor role and the choice of the profitability measure, RHS approach (Barillas and Shanken 2017) is particularly useful in investigating the value factor and proxies for the profitability factor.

3.4. Left-Hand-Side (LHS) Portfolio Characteristics

We form three sets of 3 × 3 portfolios to test asset pricing models. All stocks are allocated to three different portfolios at the end of December of each year based on market capitalization using breakpoints at the 33rd and 67th percentiles. In the second sort, we further sort each size portfolio into three sub-portfolios based on book-to-market, profitability and investment. The average portfolio monthly returns are calculated from July of year $t + 1$ using a value-weighted approach. The portfolios are rebalanced on an annual basis.

As we also want to investigate the return and other characteristics of state-owned entreprises (SOEs), we form two sub-portfolios for each size portfolio using an approach similar to the above, with one sub-portfolio containing all firms that have a government stake in the company's shares and the other sub-portfolio where the firms are entirely private.

Table 3 reports the characteristics of the single-sorted portfolios. The highest-earning portfolio is the one with average book-to-market. The loser portfolio over the sample period is the portfolio with an average investment ratio or with a weak profitability ratio.

Table 3. Characteristics of value-weighted single-sorted portfolios. The table provides time-series averages of average percentage monthly excess returns, book-to-market (B/M), profitability (OP) and investment (Inv) ratios in July of year t to June of year $t + 1$ for portfolios formed in December of year $t - 1$ on a single sort of book-to-market, profitability or investment. Portfolio breakpoints are the 33rd and 67th percentiles. Each of the ratios for a portfolio in a given year is the value-weighted average of the ratios for the firms in the portfolios. Firms in the columns ownership are sorted on (state) ownership structure. Column low (under book-to-market) shows the characteristics of the portfolios of stocks with low book-to-market ratio. Column Ave shows the characteristics of portfolios of stocks with an average book-to-market ratio. Column High shows the characteristics of portfolios of stocks with a high book-to-market ratio. Column weak (under profitability) shows the characteristics of the portfolios of stocks with a low profitability ratio. Column Ave (under Profitability) shows the characteristics of portfolios of stocks with an average profitability ratio. Column Robust shows the characteristics of portfolios of stocks with high profitability ratio. Column Conserv (under Investment) shows the characteristics of portfolios of stocks with a low investment ratio. Column Ave shows the characteristics of portfolios of stocks with average investment ratio. Column Aggr shows characteristics of portfolios of stocks with high investment ratio. The sample is from September 2008 to July 2015.

	Book-to-Market			Profitability			Investment			Ownership	
	Low	Ave	High	Weak	Ave	Robust	Conserv	Ave	Aggr	SOE	non-SOE
Excess returns	−0.66	−0.09	−0.14	−0.99	−0.53	−0.55	−0.69	−1.00	−0.22	−0.21	−0.59
B/M	0.57	1.18	1.64	1.23	1.07	0.66	1.01	0.88	0.65	0.67	0.78
OP	0.29	0.15	0.08	0.02	0.04	0.31	0.18	0.21	0.27	0.22	0.25
Inv	0.24	0.19	0.11	0.13	0.18	0.23	0.13	0.16	0.27	0.14	0.23

The results in Table 3 provide the 3 × 3 single-sorted portfolio characteristics consistent with factor characteristics in panel B of Table 2. Firms with low book-to-market ratio have high profitability and invest more than those with low book-to-market values.

One interesting finding from our ownership structure analysis shows that SOEs have significantly higher average excess returns, though they invest less aggressively and have lower profitability and book-to-market ratios compared with private (non-SOE) firms. One potential explanation is that investors prefer SOEs that are backed by the government and have more stable operations during unfavorable market conditions and survived better through the economic recession (Cornett et al. 2010).

Table 4 provides detailed summary statistics for three sets of nine double-sorted portfolios to be used in asset pricing tests. The two last columns show the sorting by size and state-ownership structure of the firm. Panel A shows the monthly excess returns for each portfolio. Panel B reports the average B/M ratio for a portfolio, while panels C and D show the profitability and investment ratios of each portfolio.

Table 4. Characteristics of double-sorted portfolios. The table provides time-series averages of average percentage monthly excess returns, book-to-market, profitability and investment ratios in July of year t to June of year $t + 1$ for portfolios formed in December of year $t - 1$ on double sort of size and a combination of book-to-market, profitability and investment. The portfolio formation and book-to-market, profitability and investment ratios follow Fama and French (2015) methodology. Each of the ratios for a portfolio in a given year is the value-weighted average of the ratios for the firms in the portfolios. Firms in the columns ownership are sorted by size and ownership structure. Panel (**A**) provides time-series averages of monthly returns in excess of Vietnam's interbank offer rate (in percentages). Panel (**B**–**D**) show the book-to-market, profitability and investment times-series averages for a portfolio. Column Low (below Book-to-market) shows the characteristics of portfolios of stocks sorted by size (small, medium and large) and low book-to-market ratio. Column Ave shows the characteristics of the portfolios of stocks sorted by size (small, medium and large) and average book-to-market ratio. Column High shows the characteristics of the portfolios of stocks sorted by size (small, medium and large) and high book-to-market ratio. Column Weak (below profitability) shows the characteristics of portfolios of stocks sorted by size (small, medium and large) and low profitability ratio. Column Ave shows the characteristics of portfolios of stocks sorted by size (small, medium and large) and average profitability ratio. Column Robust shows characteristics of portfolios of stocks sorted by size (small, medium and large) and high profitability ratio. Column Conserv (below investment) shows characteristics of portfolios of stocks sorted by size (small, medium and large) and low investment ratio. Column Ave shows characteristics of portfolios of stocks sorted by size (small, medium and large) and average investment ratio. Column Aggr shows characteristics of portfolios of stocks sorted by size (small, medium and large) and high investment ratio. The sample is from September 2008 to July 2015.

	Book-to-Market			**Profitability**			**Investment**			**Ownership**	
	Low	**Ave**	**High**	**Weak**	**Ave**	**Robust**	**Conserv**	**Ave**	**Aggr**	**SOE**	**non-SOE**
					Panel A: Excess returns						
Small	0.29	0.43	0.28	0.27	−0.22	0.65	0.68	−0.10	0.36	1.23	0.13
Medium	−0.83	−0.20	−0.18	−0.17	−0.63	−0.31	−0.01	−0.56	−0.43	−0.34	−0.43
Large	−0.88	0.24	−0.38	−0.87	−0.37	−0.53	−0.80	−0.91	−0.33	−0.24	−0.62
					Panel B: Book-to-market						
Small	1.16	1.52	1.98	1.55	1.54	1.51	1.52	1.61	1.48	1.44	1.50
Medium	0.89	1.23	1.69	1.28	1.28	1.27	1.36	1.31	1.16	1.19	1.26
Large	0.49	0.85	1.37	1.09	0.86	0.59	0.92	0.75	0.61	0.63	0.71
					Panel C: Profitability						
Small	0.03	0.03	0.04	0.01	0.02	0.06	0.04	0.02	0.04	0.05	0.03
Medium	0.08	0.09	0.08	0.01	0.04	0.17	0.08	0.08	0.09	0.06	0.09
Large	0.32	0.23	0.13	0.03	0.08	0.37	0.21	0.26	0.28	0.23	0.27

	Panel D: Investment										
Small	0.20	0.20	0.10	0.18	0.14	0.18	0.11	0.19	0.21	0.19	0.16
Medium	0.26	0.17	0.12	0.12	0.22	0.19	0.11	0.20	0.23	0.15	0.18
Large	0.27	0.18	0.15	0.16	0.20	0.24	0.14	0.18	0.27	0.13	0.24

Panel A of Table 4 reports no obvious univariate relationship between the average excess returns and the B/M, profitability and investment of listed firms across all portfolios. Fama and French (2015, 2017) report that the five-factor model fails to capture the low average return on small stocks.

The size effect is found in all portfolios, except for the return characteristics of large-cap firms with an average book-to-market ratio, with an average profitability ratio and a high investment ratio (panel A of Table 4) as well as the investment characteristics of portfolios sorted by size–profitability (panel D of Table 4). Small firms have higher average returns and B/M values despite the evidence that they are, on average, less profitable and invest less than large-cap firms (Except for the cases when small-sized SOEs invest more than large-cap SOEs). The winner portfolio for each set of sorting would be all small-cap firms, either with average B/M, high profitability or low investment ratio or belong to the SOE group. However, the best performer among all portfolios is the small-cap SOEs with an average excess return of 1.23% per month. Multivariate regressions would provide a clearer picture on the average return behavior in the Vietnamese market.

We also performed sorting on the state holdings of a firm and suggested that there is a return premium for state entities, with small-cap firms having the highest returns. There is a size effect in all characteristics of portfolios of non-SOEs sorted by size. The portfolio of private firms has the higher B/M, portfolio and investment ratios compared with that of state-owned entities (except the small-sized portfolio sorted on profitability and investment).

There is a strong evidence of the similar size patterns of different characteristics of SOEs and non-SOEs except for investment characteristics of portfolios based on ownership sorting.

Although the FF sort does not provide much information on the univariate characteristics of portfolios sorted by size and B/M, profitability and investment, our sort on ownership structure provides some interesting findings. Profitable private firms (non-SOEs) tend to provide lower returns to investors than their counterparts. Mid- and large-cap non-SOEs tend have higher profits and invest more aggressively than SOEs of the same size.

4. Empirical Results on Asset Pricing Tests

Table 5 reports the summary results of asset pricing tests. For brevity, we report the average adjusted R-squared, GRS test statistics and its p-values, the average values of absolute intercepts, Sharpe ratios for intercepts, the maximum squared Sharpe ratio for intercepts and model factors (Fama and French 2018). The tests report the results of three asset pricing models, namely FF three-factor, FF four-factor (i.e., FF five-factor without HML) and FF five-factor.

Table 5. Characteristics of double-sorted portfolios. The table provides the summary results of the multivariate regressions for portfolios formed by size and a combination of book-to-market (B/M), profitability (OP), investment (Inv), SOE and non-SOEs. Portfolios are formed in July of year t to June of year $t + 1$ from the stock sorted in December of year $t - 1$. The portfolio formation and book-to-market (HML), profitability (RMW) and investment (CMA) factor construction follow Fama and French's (1993, 2015) methodology. Summary results show the average value of all adjusted R-squared (Panel (**A**)) and the absolute intercepts ($A\,|\alpha|$) (Panel (**D**)) of all portfolios from the respective regressions (Eq. (**1**), (**2**) and (**3**)). GRS in Panel (**B**) is the Gibbons et al. (1989) test statistic and its p-value, $p(GRS)$, is shown in Panel (**C**). Sh(α) in Panel (**E**), $Sh^2(\alpha)$ in Panel (**F**) and $Sh^2(f)$ in Panel (**G**) are the Sharpe ratio for intercepts, its maximum squared value and the maximum squared Sharpe ratio for the model's factors, respectively. We apply these five tests to all portfolios

(All) and portfolios formed by size and a combination of book-to-market (B/M), profitability (OP), investment (Inv). The tests also show the results for the portfolios sorted by size and a combination of SOEs and non-SOEs. The sample is from September 2008 to July 2015.

Panel A: Adjusted $\bar{R}^2$	All	B/M	OP	Inv	SOE	non-SOE
Fama–French 3-factor	0.8958	0.9080	0.8969	0.8825	0.6721	0.9618
Fama–French 4-factor	0.8949	0.8969	0.9044	0.9091	0.6755	0.9570
Fama–French 5-factor	0.9049	0.8825	0.8898	0.8960	0.6715	0.9630
Panel B: GRS	All	B/M	OP	Inv	SOE	non-SOE
Fama–French 3-factor	1.5629	1.0278	1.1892	0.9157	4.2280	9.9838
Fama–French 4-factor	1.5403	1.4262	1.3022	1.0259	3.9507	11.7091
Fama–French 5-factor	1.4003	0.9739	1.0858	0.7789	3.7389	10.8280
Panel C: $p(GRS)$	All	B/M	OP	Inv	SOE	non-SOE
Fama–French 3-factor	0.0822	0.4268	0.3157	0.5170	0.0080	0.0000
Fama–French 4-factor	0.0902	0.1935	0.2516	0.4286	0.0113	0.0000
Fama–French 5-factor	0.1484	0.4689	0.3843	0.6363	0.0146	0.0000
Panel D: $A|\alpha|$	All	B/M	OP	Inv	SOE	non-SOE
Fama–French 3-factor	0.0033	0.0032	0.0051	0.0030	0.0137	0.0072
Fama–French 4-factor	0.0043	0.0032	0.0039	0.0031	0.0135	0.0086
Fama–French 5-factor	0.0029	0.0034	0.0038	0.0026	0.0135	0.0073
Panel E: $\text{Sh}|\alpha|$	All	B/M	OP	Inv	SOE	non-SOE
Fama–French 3-factor	0.9040	0.3657	0.3980	0.3578	0.4112	0.6318
Fama–French 4-factor	0.9102	0.4307	0.4165	0.3787	0.4019	0.6920
Fama–French 5-factor	0.8913	0.3559	0.3803	0.3300	0.4003	0.6813
Panel F: $\text{Sh}^2|\alpha|$	All	B/M	OP	Inv	SOE	non-SOE
Fama–French 3-factor	0.8171	0.1337	0.1584	0.1280	0.1691	0.3992
Fama–French 4-factor	0.8285	0.1855	0.1734	0.1434	0.1616	0.4788
Fama–French 5-factor	0.7944	0.1267	0.1446	0.1088	0.1603	0.4642
Panel G: $\text{Sh}^2|f|$	All					
Fama–French 3-factor	0.0266					
Fama–French 4-factor	0.0363					
Fama–French 5-factor	0.0725					

Overall, the test statistics show that the new model can account for more asset pricing anomalies than the traditional asset pricing models of CAPM, the three-factor and the four-factor model. Consistent with Fama and French's (2015) results, the five-factor model tested on the Vietnamese stock market performs best in relation to explaining the average returns of three sets of nine portfolios sorted by B/M, profitability and investment (column All of each panel). The average of adjusted R-squared for all double-sorted portfolios (column All of panel A) improves from 89.58% (the three-factor model) to 90.49% (the five-factor model), with the lowest performing (four-factor) model at 89.49% average adjusted R-squared. Our result is consistent with the average adjusted R-squared for the Asia Pacific region (Fama and French 2017). Similar results of superiority of the five-factor model over the three-factor are found for the Australian stock market (Chiah et al. 2016).

Looking at each set of portfolios, the five-factor model still outperforms all other models in explaining the expected returns of portfolios with each sorted by size and either book-to-market ratio, profitability or investment. The average adjusted R-squared for size-B/M sorted portfolios (column B/M of panel A), size-profitability portfolios (column OP of panel A) and size-investment portfolios (column Inv of panel A) is 91.0%, 90.9% and 89.6% for the five-factor model, respectively.

Table 5 shows consistent results of the Fama–French five-factor model's superiority as evidenced in the tests of panels A to G for all 27 portfolios (column A of all panels) and for three sets of nine portfolios with each sorted by size and a combination of B/M (column B/M of all panels), operating profitability (column OP of all panels) and investment (column Inv of all panels). Despite there being different rankings for the three- and four-factor models among the portfolios, all results consistently show the superiority of the five-factor model (columns All, B/M, OP and Inv of panel D).

In relation to portfolios sorted on state ownership, the obtained results of the average adjusted R-squared for SOEs (column SOE of panel A) contradict that of the remaining tests. Although the average value of absolute intercepts, GRS test statistics and its *p*-value extend the preference to the five-factor model for the SOE-size portfolios, the average adjusted R-squared shows the preference for the four-factor model. Referring to the results of the maximum squared Sharpe ratio for intercepts (Fama and French 2018), we conclude that the five-factor is the best model to capture stock returns of SOE portfolios sorted by size (column SOE of panel F).

Referring to the results of non-SOEs, we found that the average adjusted R-squared prefers the five-factor model, but GRS test statistics and the tests for intercepts (column non-SOE in panels B, D and E) point out the priority of the three-factor model. Based on the maximum squared Sharpe ratio for intercepts, $Sh^2(\alpha)$, we conclude that the three-factor still takes the place as the best model to explain the non-SOE portfolio sorted by size (column non-SOE of panel F) (In our unreported results of the maximum squared Sharpe ratio for intercepts with the cash profitability factor, we also find supporting evidence of the Fama–French five-factor model's superiority for all six portfolios sorted by size and state ownership as well as for three SOE portfolios sorted by size. Three-factor model is preferred over other models for non-SOE portfolios sorted by size). We came to the conclusion that the three-factor model best explains the variation in returns of non-SOEs and the five-factor model is most preferred for all portfolios sorted by size and state ownership as well as SOE portfolios sorted by size from the results of the maximum squared Sharpe ratio for intercepts (columns SOE and non-SOE of panel F).

Notably, Fama and French (2015) reported that the five-factor model produces lower GRS statistics than the original three-factor model (the lowest GRS test statistic as compared with the three-factor model is produced by the five-factor model in the portfolio sorted by size and profitability). Our results in Table 5 show that the GRS test statistic is at its lowest of 0.78 for the portfolio sorted by size and investment (Inv) with the highest *p*-value of 0.64 for GRS. The average value of absolute intercepts also shows that the largest improvement of the five-factor model is produced for the size-investment portfolios, consistent with GRS test values. Additional tests are conducted to decide on the explanatory power of Fama–French multi-factor models: the maximum squared Sharpe ratio for intercepts ($Sh^2(\alpha)$) and the maximum squared Sharpe ratio for factors ($Sh^2(f)$). Both tests show the superiority of the five-factor model consistent over all types of portfolio testing, with the exception for the SOE portfolios sorted by size. Overall, the results of Table 5 show that the five-factor model is the preferred model for all portfolios sorted by size and a combination of B/M, profitability and investment, taken together or standalone, and for the portfolios of SOEs sorted by size.

Fama and French (2015) report that HML is redundant for describing US average returns during the period 1962–2013, but it is not redundant for explaining average returns in any region during the 1990–2014 period (Fama and French 2017). They observed a strong positive relationship between the book-to-market ratio and average returns of Japanese equities. Consistent with Fama and French's (2017) findings in Europe, Japan and the Asia Pacific region, we provide evidence that HML is not redundant in Vietnam. Our results for the Vietnamese stock market provide evidence that without the value factor (HML), the asset pricing model with only market, size, profitability and investment factors performs worse than the traditional three-factor model with market, size and value factors (panels A, D, E and F). The value factor became even more important under the five-factor model (panel D). The five-factor model minimizes the intercept effects for all portfolios through a large difference in average mean intercepts between the four-factor and five-factor models. Hence, we can suggest that some anomalies can be eliminated from previous versions of asset pricing models by including the value factor. There is only one portfolio, the SOE portfolio, sorted by size that has no obvious difference in average absolute intercepts between the four- and five-factor models. However, the maximum squared Sharpe ratio provides evidence that the five-factor model is the best one to explain the SOE returns. Table 7 will provide further investigation of the value factor redundancy.

Overall, Table 5 shows that the five-factor model performs relatively well in explaining the expected returns of 27 portfolios with each of the nine portfolios sorted on either book-to-market, profitability or investment. GRS fails to reject all of the models, providing the preference for the five-factor model as the best one among all tested. The maximum squared Sharpe ratio for intercepts gives a preference to the five-factor model with the exception of the non-SOE portfolios sorted by size. The maximum squared Sharpe ratio for factors shows that the five-factor is superior to three- and four-factor models in explaining the stock returns.

5. Is the Value Factor (HML) Redundant?

As our previous asset pricing tests suggests, the FF five-factor model works best and has superiority over the three-factor model when we include HML in the model. To further test our hypothesis of HML redundancy and to see the relationship of the factors, we run a regression of each factor on the other remaining four to determine whether the explanatory variables can absorb the factor or not. Table 6 shows the results of five spanning regressions (in columns) with MKT, SMB and HML, RMW and CMA as the dependent variables in each of the regressions. In the first model, where the dependent variable is the return on market portfolio (MKT), the average market returns being left unexplained by the model are negligible, as the effect is absorbed by HML (0.61% per month, *t*-stat = 2.34) and CMA (−0.97% per month, *t*-stat = −2.24) factors. The same happens when running the test on HML; that is, the value effect is absorbed by both market (MKT) and investment (CMA) factors. Consistent with the results we get from panel B of Table 2 where the correlation between HML and CMA is found to be highest, the average HML returns are captured by the exposures of HML to CMA and MKT. However, unlike Fama and French's results, which show that CMA and RMW absorb all the effects of HML, our test reports that the average CMA return is captured to a greater extent by its exposure to HML; RMW cannot absorb HML. Notably, we found a similar controversy about the RMW and SMB with the largest negative correlation (panel B of Table 2). Table 6 shows that in non-nested multivariate regression, RMW largely absorbs the SMB effect. Hence, the evidence suggests that in Vietnam, adding HML improves the mean-variance efficient tangency portfolio produced by combining the risk-free asset, the market, size, profitability and investment portfolios. One possible explanation for the value factor redundancy in Vietnam can be the strong correlation between the profitability and value factors (−0.49) as opposed to the US market (Fama and French 2015). Cakici (2015) also highlights the similar evidence on the correlation of these two factors for Japan which is different from other regions in the world.

Table 6. Testing a Fama–French factor by regressing the remaining variables of the five-factor model. The table reports the results of time-series regressions with each of the variables being regressed by the remaining of the five factors. MKT is the value-weighted excess return on the market portfolio, and SMB is average return on the portfolio sorted by size. HML is the value factor with size and book-to-market sort. RMW is the profitability factor. CMA is the investment factor. All factors are 2 × 3 portfolios constructed using Fama and French's (1993, 2015) methodology. $Sh^2(f)$ is the maximum squared Sharpe ratio for a model's factors from Table 5. α, $s(e)$ and $\alpha^2/sd^2(e)$ are the factor's intercept, residual standard error from spanning regressions and the marginal contribution of a factor to a model's $Sh^2(f)$, respectively. The Newey–West *t*-statistic is given in parentheses. The sample is from September 2008 to July 2015.

	MKT	SMB	HML	RMW	CMA

MKT		−0.12	0.12 **	−0.05	−0.13 **
		(−1.63)	(2.06)	(−0.96)	(−2.29)
SMB	−0.39		0.19 *	−0.34 ***	−0.13
	(−1.39)		(1.67)	(−3.73)	(−1.18)
HML	0.61 **	0.27 *		−0.18	0.40 ***
	(2.34)	(1.84)		(−1.30)	(4.56)
RMW	−0.39	−0.76 ***	−0.28		−0.15
	(−0.99)	(−5.14)	(−1.25)		(−0.94)
CMA	−0.97 **	−0.30	0.60 ***	−0.15	
	(−2.24)	(−1.22)	(4.25)	(−0.89)	
α	−0.01	0.00	0.01	0.01 *	−0.00
	(−0.66)	(0.92)	(1.57)	(1.84)	(−0.36)
Adj.R^2	0.117	0.362	0.414	0.415	0.314
$Sh^2(f)$	0.073	0.073	0.073	0.073	0.073
s(e)	0.008	0.005	0.004	0.006	0.003
$\alpha^2/sd^2(e)$	0.006	0.010	0.036	0.040	0.000

t-statistics in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

To further verify our findings on HML redundancy, we follow Fama and French (2018) to deconstruct the maximum squared Sharpe ratio for a model's factors, $Sh^2(f)$, in Table 5 by analyzing the extent of the marginal contribution of a factor to $Sh^2(f)$, $\alpha^2/sd^2(e)$, defined as the squared intercept over the variance of the regression residuals, and t-statistics for the intercept ($t(\alpha)$) in a factor-spanning regression. The factor's intercept (α) is close to zero and/or the residual standard error, $s(e)$, is large if the factor's expected return is well explained by the remaining factors in a model. Hence, a factor is considered to be redundant if its marginal contribution to a model's maximum squared Sharpe ratio is small. The results of $\alpha^2/sd^2(e)$ in Table 6 report that RMW and CML are by far the biggest marginal contributions to $Sh^2(f)$, which further supports our finding on the value factor in Table 5. Therefore, the value factor is confirmed to be non-redundant in the factor models for the Vietnamese stock market.

6. Operating, Cash or ROE Profitability?

Fama and French (2018) provide evidence that the five-factor model (Fama and French 2015) is sensitive to the choice of the profitability factor. More specifically, the cash profitability suggested by Ball et al. (2015) improves the description of the average returns for portfolios of different sorts.

Cash profitability (RMWC) is the cash profits without accruals (i.e., before interest) scaled by total assets in the 2 × 3 portfolios sorted by size and profitability. Using cash profitability (Ball et al. 2015), Fama and French (2018) try to explain small stocks with returns that behave like those of firms that invest a lot despite low profitability (Fama and French 2015, 2017). Although we do not have a similar issue, we are interested in the choice of profitability factor that would be best for the five-factor model to explain the variation in the Vietnamese stock market. Table 7 shows the hypothesis that higher profitability leads to higher expected returns is only correct for large stocks with ROE profitability (Hou et al. 2019). This hypothesis is also true for small and medium equities if we use cash profitability (Ball et al. 2015). The size effect is evident in the returns of all double-sorted portfolios, except for portfolios with average operating profitability (Novy-Marx 2013), average cash profitability (Ball et al. 2015) and low profitability (Hou et al. 2019).

Table 7. Characteristics of portfolios sorted on a combination of size and operating profitability, cash profitability or return-on-equity (ROE) profitability. The table provides time-series averages of excess returns, book-to-market, profitability and investment ratios in July of year t to June

of year $t + 1$ for portfolios formed in December of year $t - 1$ on the double sort of size and a combination of cash profitability (Ball et al. 2015; Fama and French 2018), ROE profitability (Hou et al. 2015, 2019) and operating profitability (from Table 4). The portfolio formation and book-to-market, profitability and investment ratios follow the Fama and French (2015) methodology. Each of the ratios for a portfolio in a given year is a value-weighted average of the ratios for the firms in the portfolios. Panel (**A**) provides time-series averages of the monthly returns in excess of Vietnam's interbank offer rate (in percentages). Panels (**B**–**D**) show the book-to-market, profitability and investment times-series averages for a portfolio. Column Weak shows the characteristics of portfolios of stocks sorted by size (small, medium and large) and low profitability ratio. Column Average shows the characteristics of portfolios of stocks sorted by size (small, medium and large) and average profitability ratio. Column Robust shows characteristics of portfolios of stocks sorted by size (small, medium and large) and high profitability ratio. The sample is from September 2008 to July 2015.

	Operating Profitability			**Cash Profitability**			**ROE Profitability**		
	Weak	**Average**	**Robust**	**Weak**	**Average**	**Robust**	**Weak**	**Average**	**Robust**
Panel A: Excess returns									
Small	0.27	−0.22	0.65	0.14	0.15	0.53	0.22	0.20	0.45
Medium	−0.17	−0.63	−0.31	−0.42	−0.35	−0.30	−0.36	−0.26	−0.48
Large	−0.87	−0.37	−0.53	−0.79	−0.22	−0.43	0.54	−0.63	−0.79
Panel B: Book-to-market									
Small	1.55	1.54	1.51	1.66	1.62	1.33	1.81	1.61	1.32
Medium	1.28	1.28	1.27	1.40	1.34	1.11	1.60	1.30	1.06
Large	1.09	0.86	0.59	0.74	0.70	0.71	1.19	1.02	0.59
Panel C: Profitability									
Small	0.01	0.02	0.06	0.04	0.08	0.18	0.00	0.01	0.02
Medium	0.01	0.04	0.17	0.03	0.08	0.19	0.02	0.03	0.09
Large	0.03	0.08	0.37	0.01	0.04	0.12	0.28	0.43	0.81
Panel D: Investment									
Small	0.18	0.14	0.18	0.19	0.17	0.16	0.07	0.19	0.21
Medium	0.12	0.22	0.19	0.14	0.19	0.20	0.12	0.16	0.23
Large	0.16	0.20	0.24	0.17	0.27	0.22	0.23	0.21	0.21

Panel B of Table 7 shows the identical patterns for B/M regardless of the choice of profitability factor, that is, smaller firms tend to have higher book-to-market ratios. Panel C of Table 7 shows an opposite size pattern for cash profitability as compared with portfolios calculated using operating and ROE profitability. One explanation would be that small firms rely more on equity capital and have lower access to borrowing. Hence, we observe such contradictory results.

Table 8 is the direct comparison of the FF multi-factor model performance when using different profitability ratios. The model with Ball et al.'s (2015) cash profitability factor, RMWC (panel A), outperforms the model with RMW (Fama and French 2015; Novy-Marx 2013) and the model with ROE profitability, RMWR (Hou et al. 2015, 2019), in the tests of the average adjusted R-squared performed on all portfolios (columns All of panels A, B and C). However, $Sh(\alpha)$, p-value of GRS, the average value of absolute intercepts, $A|\alpha|$, show preference for RMW. The GRS test values for the five-factor model further complicate the analysis, providing very low results for size-BM, size-Inv porfolios using operating profitability in panel C and showing RMWC is the best model among four-factor models. Therefore, we rely on the maximum squared Sharpe ratio, $Sh^2(\alpha)$, to determine which profitability measure suits best the four-factor and five-factor models. The results indicate that RMWC is equally good when testing all 27 portfolios taken together (column All of $Sh^2(\alpha)$ in Table 8) and RMW is superior to all other models when it comes to explain the variation of each of the three sets of porfolios sorted by size and a combination of value, profitability and investment (columns B/M, Profit and Inv of $Sh^2(\alpha)$ in Table 8).

Table 8. Summary of the regression results using cash profitability and ROE profitability factors. Panel (**A**) of this table describes the average adjusted R-squared of all portfolios sorted by size and a combination of B/M, profitability, investment and the average adjusted R-squared of size-All (All), size-SOE (SOE) and size-non-SOE sorted (non-SOE) portfolios. The portfolio formation and book-to-market (HML), cash profitability (RMWC) and investment (CMA) factor construction follow Fama and French's (1993, 2015, 2018) methodology. Summary results show the average value of all adjusted R-squared (Adj.R^2) and the absolute intercepts ($A|\alpha|$) of all portfolios from the respective regressions in panels A to D of Table 6. GRS is the Gibbons et al. (1989) test statistic and its p-value, $p(GRS)$. Sh(α) and $Sh^2(\alpha)$ are the Sharpe ratio for intercepts and its maximum squared value, respectively. We apply these five tests to all portfolios (All) and the portfolios formed by size and a combination of book-to-market (B/M), profitability (OP), investment (Inv). Column "SOE" shows the results for companies classified as state-owned and "non-SOE" column reports the results on the privately owned group of listed firms. Fama–French five-factor model with RMWC: $R_{p,t} = \alpha_p + b_p MKT_t + s_p SMB_t + h_p HML_t + r_p RMWC_t + c_p CMA_t + \varepsilon_{p,t}$. Fama–French four-factor model (without HML): $R_{p,t} = \alpha_p + b_p MKT_t + s_p SMB_t + r_p RMWC_t + c_p CMA_t + \varepsilon_{p,t}$. The sample is from September 2008 to July 2015. Panel (**B**) follows the same data and methodology as in panel A with the ROE profitability, RMWR, (Hou et al. 2015, 2019) as the proxy for a profitability factor. The Fama–French five-factor model with RMWR: $R_{p,t} = \alpha_p + b_p MKT_t + s_p SMB_t + h_p HML_t + r_p RMWR_t + c_p CMA_t + \varepsilon_{p,t}$. Fama–French four-factor model (without HML): $R_{p,t} = \alpha_p + b_p MKT_t + s_p SMB_t + r_p RMWR_t + c_p CMA_t + \varepsilon_{p,t}$. The sample is from September 2008 to July 2015. Panel (**C**) displays the summary results of Table 5 with operating profitability (RMW) in the models.

	Adjusted $\bar{R}^2$			GRS				Sh(α)			
Summary results	All	SOE	non-SOE	All	B/M	Profit	Inv	All	B/M	Profit	Inv
Panel A: Using RMWC as profitability factor											
Fama–French 4-factor	0.8952	0.6943	0.9590	1.53	1.22	1.42	1.37	0.90	0.40	0.43	0.42
Fama–French 5-factor	0.9096	0.6946	0.9678	1.41	1.04	1.22	1.09	0.89	0.38	0.42	0.39
Panel B: Using RMWR as profitability factor											
Fama–French 4-factor	0.8929	0.6809	0.9566	1.76	1.19	1.52	1.37	0.96	0.39	0.44	0.42
Fama–French 5-factor	0.9061	0.6837	0.9649	1.65	1.02	1.32	1.14	0.95	0.37	0.42	0.39
Panel C: Using RMW as profitability factor											
Fama–French 4-factor	0.8949	0.6755	0.9570	1.54	1.19	1.30	1.09	0.67	0.40	0.42	0.38
Fama–French 5-factor	0.9049	0.6715	0.9630	1.40	0.92	1.03	0.78	0.66	0.36	0.38	0.33
	$A\|\alpha\|$			$p(GRS)$				$Sh^2(\alpha)$			
Summary results	All	SOE	non-SOE	All	B/M	Profit	Inv	All	B/M	Profit	Inv
Panel A: Using RMWC as profitability factor											
Fama–French 4-factor	0.0038	0.0129	0.0061	0.09	0.30	0.28	0.22	0.82	0.16	0.19	0.18
Fama–French 5-factor	0.0034	0.0126	0.0076	0.14	0.42	0.29	0.38	0.79	0.14	0.17	0.15
Panel B: Using RMWR as profitability factor											
Fama–French 4-factor	0.0039	0.0139	0.0080	0.04	0.31	0.16	0.22	0.92	0.15	0.19	0.18
Fama–French 5-factor	0.0031	0.0133	0.0067	0.06	0.43	0.24	0.35	0.90	0.14	0.18	0.15
Panel C: Using RMW as profitability factor											
Fama–French 4-factor	0.0043	0.0135	0.0086	0.09	0.32	0.25	0.38	0.83	0.16	0.17	0.14
Fama–French 5-factor	0.0029	0.0135	0.0073	0.15	0.52	0.43	0.64	0.79	0.13	0.14	0.11

Despite the results of the aforementioned tests give preference to the FF five-factor model over all others under analysis, we found contradicting results in the choice of profitability factor when turning our attention to the comparison of the four-factor models. $Sh^2(\alpha)$ indicates the superiority of cash profitability (RMWC) when testing all 27 portfolios but not for each set of double-sorted portfolios (the FF 4-factor model of columns B/M, Profit and Inv in Table 8).

The results show that regardless of the profitability factor choice, the superiority of the five-factor model in explaining the average returns as compared with the four-factor models is consistent among all tests, as shown in Table 8 across all profitability factors.

To further testify our results on profitability measures, we conducted a test of profitability factors similar to the test applied to the value factor for redundancy. Given inconclusive results over the choice of profitability factors in Table 8, Table 9 with $\alpha^2/sd^2(e)$ confirms the superiority of the operating profitability over the cash and ROE profitability factors, with the RMW intercepts having slightly more incremental information about the average returns under the tests. Operating profitability (RMW) is likely to perform better than cash profitability (RMWC) and ROE profitability (RMWR).

Table 9. Testing the profitability factors. The table reports the results of time-series regressions with each of the profitability variables (operating profitability (RMW), cash profitability (RMWC) and ROE profitability (RMWR)) being regressed by the remaining five factors. MKT is the value-weighted excess return on the market portfolio, and SMB is the average return on the portfolio sorted by size. HML is the value factor sorted by size and book-to-market ratio. RMW is the operating profitability factor (Fama and French 2015). RMWC is the cash profitability factor (Fama and French 2018; Ball et al. 2015). RMWR is the ROE profitability factor (Hou et al. 2015, 2019). CMA is the investment factor. All factors are 2 × 3 portfolios constructed using the Fama and French (1993, 2015) methodology. $Sh^2(f)$ is the maximum squared Sharpe ratio for a model's all 6 factors. α, $s(e)$ and $\alpha^2/sd^2(e)$ are the factor's intercept, residual standard error from spanning regressions and the marginal contribution of a factor to a model's $Sh^2(f)$, respectively. Newey–West *t*-statistic is given in parentheses. The sample is from September 2008 to July 2015.

Results of spanning Regressions	RMW	RMWC	RMW	RMWR
MKT	−0.03	−0.11 *	−0.05	0.08 *
	(−0.47)	(−1.84)	(−1.00)	(1.94)
SMB	−0.35 ***	0.16	−0.35 ***	−0.28 ***
	(−3.78)	(1.31)	(−3.10)	(−3.28)
HML	−0.13	−0.17	−0.19	−0.37 ***
	(−1.10)	(−1.58)	(−1.35)	(−3.56)
RMW		0.33 ***		−0.01
		(2.87)		(−0.09)
RMWC/RMWR	0.21 ***		−0.01	
	(2.67)		(−0.09)	
CMA	−0.13	−0.05	−0.15	−0.09
	(−0.81)	(−0.34)	(−0.87)	(−0.61)
α	0.00	0.00	0.01 *	0.00
	(1.33)	(1.10)	(1.84)	(0.70)
Adj.R^2	0.448	0.188	0.407	0.509
$Sh^2(f)$	0.085	0.085	0.063	0.063
$s(e)$	0.003	0.004	0.003	0.003
$\alpha^2/sd^2(e)$	0.025	0.015	0.040	00.005

t-statistics in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Similar to Fama and French (2018), we provide evidence that changing the profitability from an operating one to cash profitability does not change the conclusion that all the factors have explanatory power. In addition, we provide evidence that the returns of RMWR are largely absorbed by SMB and HML. Although we see strong negative slopes on SMB for RMW under both tests with RMWC and RMWR, as discussed earlier, SMB cannot absorb RMW as shown in the results of Table 6.

7. Robustness Tests

By re-testing the five-factor model with cash profitability and ROE profitability as profitability proxies (Table 10), we reconfirm the HML non-redundancy (Fama and French (2015) found that HML is redundant for the US stock market when using operating profitability (Novy-Marx 2013)). Both panels of Table 10 report that the intercept in spanning regression using cash profitability (RMWC) and ROE profitability (RMWR) to explain HML is 0.01% per month (t = 1.63) and 0.01% per month (t = 1.50), the highest value for the *t*-statistics among all the models under both profitability versions.

Table 10. Testing the redundancy of the value factor using cash profitability (Fama and French 2018; Ball et al. 2015) and ROE profitability (Hou et al. 2019). This table reports the results of time-series regressions with each of the variables being regressed by the remaining of the five factors. MKT is the value-weighted excess return on the market portfolio, and SMB is average return on the portfolio sorted by size. HML is the value factor with size and book-to-market sort. CMA is the investment factor. All factors are 2 × 3 portfolios constructed using the Fama and French (1993, 2015) methodology. $Sh^2(f)$ is the maximum squared Sharpe ratio for a model's factors. α and $\alpha^2/sd^2(e)$ are the factor's intercept from spanning regressions and the marginal contribution of a factor to a model's $Sh^2(f)$, respectively. The Newey–West *t*-statistic is given in parentheses. The sample is from September 2008 to July 2015. Panel (**A**) shows the analysis with respect to the cash profitability factor (RMWC) by Fama and French (2018) and Ball et al. (2015). Panel (**B**) describes the ROE profitability factor (RMWR) calculated using Hou et al.'s (2019) definition.

Panel A: Cash Profitability (RMWC)					
	MKT	**SMB**	**HML**	**RMWC**	**CMA**
MKT		−0.09	0.11 *	−0.13 **	−0.13 **
		(−0.97)	(1.89)	(−2.12)	(−2.20)
SMB	−0.22		0.29 ***	0.05	−0.08
	(−0.93)		(3.59)	(0.47)	(−0.90)
HML	0.51 *	0.58 ***		−0.23 *	0.42 ***
	(1.86)	(4.30)		(−1.74)	(4.85)
RMWC	−0.56 *	0.09	−0.22		−0.06
	(−1.90)	(0.50)	(−1.50)		(−0.61)
CMA	−0.92 **	−0.24	0.62 ***	−0.10	
	(−2.13)	(−0.90)	(4.76)	(−0.58)	
α	−0.00	−0.00	0.01	0.01	−0.00
	(−0.49)	(−0.10)	(1.63)	(1.50)	(−0.49)
Adj. R^2	0.162	0.138	0.415	0.139	0.303
$Sh^2(f)$	0.062	0.062	0.062	0.062	0.062
$\alpha^2/sd^2(e)$	0.004	0.000	0.034	0.029	0.004
Panel B: ROE Profitability (RMWR)					
	MKT	**SMB**	**HML**	**RMWC**	**CMA**
MKT		−0.02	0.16 ***	0.08 **	−0.11 **
		(−0.31)	(2.92)	(1.98)	(−2.05)
SMB	−0.06		0.09	−0.28 ***	−0.11
	(−0.31)		(0.81)	(−3.01)	(−0.90)
HML	0.90 ***	0.17		−0.37 ***	0.39 ***
	(3.36)	(0.73)		(−3.68)	(3.02)
RMWR	0.67 *	−0.75 **	−0.53 ***		−0.10
	(1.93)	(−2.41)	(−2.70)		(−0.51)
CMA	−0.82 **	−0.27	0.50 ***	−0.09	
	(−2.24)	(−0.97)	(3.28)	(−0.56)	
α	−0.01	0.00	0.01	0.00	−0.00
	(−1.01)	(0.25)	(1.50)	(0.63)	(−0.55)
Adj. R^2	0.147	0.315	0.503	0.515	0.305
$Sh^2(f)$	0.037	0.037	0.037	0.037	0.037
$\alpha^2/sd^2(e)$	0.016	0.001	0.027	0.005	0.005

t-statistics in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The results of $\alpha^2/sd^2(e)$ for panel A provide evidence that the value factor contributes most to $Sh^2(f)$ of the five-factor model using cash profitability (0.034). The returns of SMB and CMA are absorbed by strong positive slopes on HML. The cash profitability is another significant marginal contributor to $Sh^2(f)$ with $\alpha^2/sd^2(e)$ of 0.029. The returns of MKT are absorbed by this factor.

Panel B provides persistent results for HML non-redundancy with the value factor having the highest marginal contribution to $Sh^2(f)$ of the five-factor model using ROE profitability (0.027). RMWR does not contribute much to $Sh^2(f)$, supporting the findings in Table 8. SMB can be well explained by RMWR. The returns of CMA and RMWR are absorbed by MKT. The MKT, RMWR and CMA returns are absorbed by strong slopes on HML.

The values of $Sh^2(f)$ as indicated in Tables 6 and 10 for the five-factor model with RMW, RMWC and RMWR are 0.073, 0.062 and 0.037, respectively. These results further indicate the preference for the operating profitability (RMW) when testing the maximum squared Sharpe ratio for the five-factor model's factors with different profitability proxies.

8. Discussion

In this paper, we empirically examined three FF factor models for the Vietnamese stock market during the period 2008–2015. Similar to Japan (Fama and French 2017), the GRS test cannot reject all the asset pricing models in their power of capturing the average returns of Vietnamese equities. Test results point out the superiority of the FF five-factor model over the three-factor and four-factor models in explaining the returns of portfolios sorted by size and a combination of book-to-market ratio, profitability and investment. While the three-factor model is a preferred model in explaining the returns of non-SOEs sorted by size, the FF five-factor model is still superior for SOEs sorted by size. Our study also reports evidence of the return premium on state-owned equities in Vietnam; that is, state-owned enterprises have significantly higher average returns than private firms, although the former invest less aggressively and have lower profitability and book-to-market ratios than private (non-SOE) firms. Profitable private firms (non-SOEs) tend to provide lower returns to investors and invest more aggressively than SOEs. We also show that investors holding the portfolio with small-cap SOEs during the sample period would bear highest returns during the sample period. The loser portfolio over the sample period is the one that contains large-sized stocks with an average investment ratio.

Our findings suggest that the value factor (HML) has a relationship with portfolio returns, and its effect is not absorbed by profitability and investment factors newly included in the traditional three-factor model (Fama and French 2015). In contrast to Fama and French (2018) findings on HML value, it is not redundant in the Vietnamese stock market after considering different measures for the profitability factor. The value factor and operating profitability have the biggest marginal contribution to the maximum squared Sharpe ratio for the five-factor model's factors (Barillas and Shanken 2017), implying HML is important in describing the stock returns in Vietnam.

The operating profitability (Novy-Marx 2013) used in the FF five-factor model is likely to perform better than cash profitability (Ball et al. 2015) and ROE profitability (Hou et al. 2015, 2019), indicating RMW intercepts have more incremental information about the average returns. All the tests provide consistent results on the superiority of the FF five-factor model over other traditional asset pricing models, regardless of the profitability factor choice.

Future research can be extended to analyze the return premium on SOE equities in Vietnam. The redundancy of the value factor in the Fama and French (2015) models can be further examined for other emerging financial markets to discover any differences in the behavior of stock returns among the countries with different development levels. It would also be interesting to challenge the time-series factor models (Fama and French 2015) against the models that use cross-sectional factors in time-series models (Fama and French 2020) for the purpose of the assessment of different model performance in predicting stock returns in developing markets.

9. Conclusions

The results of this study show the preference for the Fama–French five-factor model over the three-factor and four-factor models in explaining the average returns of all Vietnamese equities. This study also suggests that the value factor (HML) is non-redundant in this Asian market and significantly associated with portfolio returns. Regardless of the profitability factor choice, all findings remain consistent across empirical tests. Asset pricing models perform differently under different ownership structure, with the three-factor model being preferred for private equities in Vietnam.

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Data Availability Statement: The source of data is the Thomson Reuters (Datastream) database, which includes daily data of adjusted closing prices, trading volume, market-to-book ratios, market capitalization, total assets as well as annual information on revenue, administrative expense, interest expense, cost of goods sold and state ownership. An interbank offer rate was also extracted monthly from Datastream and used as the risk-free rate in this study to be consistent with previous studies on Vietnam. The results and values presented in this study are available on request from the corresponding author.

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Appendix A. Vietnam's Stock Market and Its Unique Features

The Hochiminh Stock Exchange, under a government initiative, was established on 28 July 2000. During the period 2000–2005, the stock market had very few listings. In 2005, there were 44 listed companies with a total market capitalization of VND 5 trillion. With the establishment of the Hanoi Stock Exchange in the same year and the country's favorable economic conditions, by the end of 2009 there were 541 listed companies with a total market capitalization of VND 620.5 trillion, equivalent to 40% GDP. During that year, Vietnam established a third stock market (UPCoM) to provide a pathway for small companies to trade their shares on an exchange, thus limiting the over-the-counter market and thereby increasing transparency and liquidity for Vietnamese firms.

After persistent and robust growth during the period 2006–2007, the stock market of Vietnam was hit by the global financial crisis and affected by the government's tightening monetary policies to control inflation and stabilize the economy, leading to a continuous and significant drop in stock prices. The stock market of Vietnam has been gradually stabilizing since 2008.

The first listed companies were primarily state-owned enterprises (SOEs). According to the Business Innovation and Development Committee, in August 2009, the country had more than 1500 enterprises fully owned by the state. With the goal to restructure Vietnam's economy and increase the efficiency of SOEs' performance through privatization of government-owned companies (State-owned banks operated less profitably, held less core capital and had greater credit risk than private firms, but had more stable operations during unfavorable market conditions and survived better during the financial crisis (Cornett et al. 2010)), the state gradually sold its stake in SOEs through initial public offerings (IPOs) and listing on stock exchanges. However, the government still keeps the largest ownership proportion of many listed companies. Therefore, we pay special attention to SOEs and consider them as a separate group in our analysis.

This paper presents new empirical evidence on the relationship between a state-ownership structure and stock returns in a country with distinctive political and economic regimes. The effects of state ownership are important for policymakers who focus on stock market regulation and for investors who want to understand stock price behavior in an emerging market for portfolio management.

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